File
AZ SPS-5

ARIZONA DEPARTMENT OF TRANSPORTATION

REPORT NUMBER: FHWA-AZ92-379-I

SPS-5 AND SPS-6 SHRP DATA COLLECTION

Final Report

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December 1992

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U.S. Department of Transportation
Federal Highway Administration

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1. INTRODUCTION

This report is a summary or synopsis of the activities/services performed on ADOT Contract 92-29. In 1992 ADOT contracted with ARE to prepare a series of documents relating to ADOT's activities in SPS-5 and SPS-6 of the Strategic Highway research program (SHRP). The specific objectives of the work program were:

1. Review the SHRP requirements for SPS-5 and SPS-6 data collection requirements, assemble, and complete the construction data forms.

2. Prepare strip maps indicating the PCCP slab condition prior to rehabilitation for each SHRP/ADOT test section within the SPS-6 project.

3. Prepare strip maps indicating the HMAC pavement condition prior to rehabilitation.

4. Prepare an SPS-6 construction report.

The following report sections provide summary documentation the SPS-5 and SPS-6 data collection, SPS-5 and SPS-6 strip map development, and the construction of SPS-6 sections.

2. CONSTRUCTION DATA FORMS

SPS-5

This project scope required the completion of Construction Data Forms for the Strategic Highway Research Program's (SHRP) Specific Pavement Studies (SPS) Experiment Number 5, The Rehabilitation of Asphalt Concrete Pavements. In Arizona, the SPS-5 experiment construction was done in the Eastbound Travel lane of Interstate Highway 8, between mileposts 159 and 161 in southwestern Arizona. Eleven test sections were constructed for the experiment, with eight as set forth in SHRP guidelines. In addition, two additional sections were constructed, and one designated as the control section, for a grand total of eleven sections. There are eleven (11) of the SHRP Construction Data forms and are number as such, one through eleven. Each form covers a general topic related to the rehabilitation construction. Normally, these forms would be completed as construction proceeds, however, many of these forms were not complete at the time of construction in the Summer of 1990.

Forms

As noted earlier, there are eleven Construction Data forms and are grouped by the topic of data that each covers. In general, these forms cover data related to the surface preparation, overlay placement, and material properties. The data sheets are titled as shown in Table 1.

It is important to note that some SHRP forms are filled out with project related data and others with section specific data. In the case of the Construction Data forms, the first one, number one: Reference Project Station Table, has project level data, which is applicable to all *of the sections in the project. Hence, only one form is filled out for the entire experiment* location (one project). The rest of the forms are completed with section specific data, and in some cases, several copies of each form are filled out for different layers of a given section, such as the eighth one: Overlay Compaction Data, since each layer can have different compaction methods.

Table 1. SPS-5 Construction Data Forms

Construction Data Sheet	Title / Topic
1	Reference Project Station Table
2	Revised Layer Descriptions
3	Pre-Overlay Surface Preparation Sketch
4	Asphalt Concrete Patches
5	Rut Level-Up Treatment
6	Preparation of Milled Test Sections
7	Overlay Placement Operations
8	Overlay Compaction Data
9	Construction Quality Control
10	Layer Thickness Measurements
11	Miscellaneous Construction Notes and Comments

Data Sources

The primary data source for the SPS-5 Construction Data forms is the Draft Construction Report "SPS-5: Rehabilitation of Asphalt Concrete Pavements" prepared by ASM Mustaque Hossain, PhD., Douglas J. Lattin, P.E., and Larry A Scofield, P.E. dated November 6, 1990. Since this document was described as the most complete source of information for the SPS-5 Construction project, it was used exclusively for completing the forms. When the report information was inadequate, the information was requested from Larry Scofield, who located it if it was available.

Completion

Based on the SPS-5 Construction Data forms guide for completion, the following Table 2 was created.

Table 2. Guide to SPS-5 Construction Data Form Completion for Arizona

ADOT #	11	6	3	2	8	7	1	4	5	9	10	Entire
SHRP #	01	02	03	04	05	06	07	08	09	10	11	Project
1												†
2		†	†	†	†	†	†	†	†	†	†	
3	*	*	*	*	*	*	*	*	*	*	*	
4	*	*	*	*	*	*	*	*	*	*	*	
5		*	*	*	*						*	
6		*	*	*	*	†	†	†	†	†	*	
7		†	†	†	†	†	†	†	†	†	†	
8		†	†	†	†	†	†	†	†	†	†	
9	A	A	A	A	A	A	A	A	A	A	A	
10		A	A	A	A	A	A	A	A	A	A	
11	N	N	N	N	N	N	N	N	N	N	N	

Legend

† Always completed

* If performed as appropriate

A If data available

N As needed

This table was used throughout this project as a guide to determine which forms needed to be completed for each SPS-5 section. Unfortunately, not all data was available for data form completion.

While most of the SPS-5 Construction Data forms were more than substantially completed, important information is lacking. First, the layer thickness measurements are inadequate. There are some averages and ranges for the layers, but generally lack data on a sporadic basis. Data needed includes both compacted and uncompacted layer thicknesses and more complete milled layer thicknesses. Existing data is generally incomplete. In the

Construction Report, there are also several sections where text indicates a range of compacted layer thicknesses. All of the sections also include a table with the same information, but the text and the referenced table do not agree in several sections. These could be typographical errors or simply document production errors, but they do leave some additional unknowns. Some of the tables of the milled thicknesses include substantial information,but often do not include milled depths for sections that were remilled due to initial inadequate milling. Hence, the thicknesses shown are invalid for actual depths in these cases.

In addition, there is little information about both the air temperatures at the time asphalt placement and temperatures of the asphalt itself as it was placed. Generally a range of data was available, but the data itself was not. Also, no roller compaction data was available. Nor is there any indication of the curing times that the asphalt was allowed before exposure to traffic. Little was available in terms of nuclear density information. Again, there is an indication that data was taken, since an average is presented and locations of the tests are noted, but the actual data itself was unavailable, just as the layer thickness measurements. As for profilograph data, none was encountered in the SPS-5 project data, and it is therefore, assumed that none exists.

SPS-6

This project scope required completion of Construction Data Forms for the Strategic Highway Research Program's (SHRP) Specific Pavement Studies (SPS) Experiment Number 6, The Rehabilitation of Jointed Portland Cement Concrete (PCC) Pavements. In Arizona, the SPS-6 experiment construction was done in the Eastbound Travel lane of Interstate Highway 40, between mileposts 202 and 205 in northern Arizona. Eighteen test sections were constructed for the experiment, with eight as set forth in SHRP guidelines. In addition, nine additional sections were constructed, and one designated as the SHRP control section, for a grand total of eighteen sections. There are twenty-seven (27) of the SHRP Construction Data forms and are numbered one through three, and seven through thirty. The strange numbering sequence is used to utilize some of the same forms from the SPS-5 experiment and maintain consistent form numbers. Each form covers a general topic related to the rehabilitation construction. Normally,

these forms would be completed as construction proceeds, however, many of these forms were not complete at the time of construction in the Summer and Fall of 1990.

Forms

As noted earlier, there are twenty-seven Construction Data forms and are grouped by the topic of data that each covers. In general, these forms cover data related to the surface preparation, overlay placement, and material properties. The data sheets are titled as shown in Table 3.

Again, it is important to note that some SHRP forms are filled out with project related data and others with section specific data. Again, the first one, number one: Reference Project Station Table, has project level data, which is applicable to all of the sections in the project. Hence, only one form is filled out for the entire experiment location (one project). The rest of the forms are completed with section specific data, and in some cases, several copies of each form are filled out for different layers of a given section, such as the eighth one: Overlay Compaction Data, since each layer can have different compaction methods.

Data Sources

The data sources for the SPS-6 project are much more disjointed than those of the SPS-5 project. The reason being that there was no Construction Report complete to utilize as a reference for completing the forms. Instead, we relied on numerous diaries, construction documents and records, plans, specifications, inspector's notebooks, interviews, suppliers, and project correspondence. The main task involved building the history of the construction process and extract necessary information for the Construction Data forms as we proceeded. Many times this process was hampered by a lack of pertinent records and thus, some forms are still lacking important information which may simply not be available now, if it ever was.

Completion

Based on the SPS-6 Construction Data forms guide for completion, the following Table 4. was created.

Table 3. SPS-6 Construction Data Forms

Construction Data Sheet	Title / Topic
1	Reference Project Station Table
2	Revised Layer Descriptions
3	Pre-Overlay Surface Preparation Sketch
7	Overlay Placement Operations
8	Overlay Compaction Data
9	Construction Quality Control Measurements
10	Layer Thickness Measurements
11	Miscellaneous Construction Notes and Comments
12	Partial Depth Patching Data for Pavements with PCC Surfaces
13	Partial Depth Patching Data for Pavements with PCC Surfaces (Continued)
14	Partial Depth Patching Data for Pavements with PCC Surfaces (Continued)
15	Joint Resealing Data for Pavements with PCC Surfaces
16	Joint Resealing Data for Pavements with PCC Surfaces (Continued)
17 & 18	Crack Sealing Data for Pavements with PCC Surfaces
19	Diamond Grinding for Pavement Surfaces
20	Full Depth Repair Data for Pavements with PCC Surfaces
21	Full Depth Repair Data for Pavements with PCC Surfaces (Continued)
22	Full Depth Repair Data for Pavements with PCC Surfaces (Continued)
23	Full Depth Repair Data for Pavements with PCC Surfaces (Continued)
24 & 25	Load Transfer Restoration for Pavements with PCC Surfaces
26 & 27	Undersealing for Pavements with PCC Surfaces
28	Subdrainage Retrofit Data for Pavements with PCC Surfaces
29	Crack/Break and Seat Data for Pavements with PCC Surfaces
30	Saw and Seal Data for PCC Surfaces with Asphaltic Concrete Overlays

Table 4. Guide to SPS-6 Construction Data Form Completion for Arizona

ADOT #	13	12	10	8	11	5	4	3	1	6	7	9	2	14	15	16	17	18	19	Entire
SHRP #	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	Project
1																				†
2			†	†		†	†	†	†	†	†	†	†	†	†	†	†	†	†	
3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
7			†	†		†	†	†	†	†	†	†	†	†	†	†	†	†	†	
8			†	†		†	†	†	†	†	†	†	†	†	†	†	†	†	†	
9		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
10			†	†		†	†	†	†	†	†	†	†	†	†	†	†	†	†	
11	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
12		*	*	*	†	†														
13		*	*	*	†	†														
14		*	*	*	†	†														
15	*	*			†															
16	*	*			†															
17 & 18	*	*			†															
19		*			†															
20		*	*	*	†	†														
21		*	*	*	†	†														
22		*	*	*	†	†														

ADOT #	13	12	10	8	11	5	4	3	1	6	7	9	2	14	15	16	17	18	19	Entire
SHRP #	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	Project
23		*	*	*	†	†														
24 & 25					*	*														
26 & 27					*	*														
28					†	†	†	†	†	†	†	†	†							
29							†	†		†	†	†	†		†		†			
30				†																
Rubblize																†			†	

Legend

† Always completed

* If performed as appropriate

A If data available

N As needed

This table was used throughout this project as a guide to determine which forms needed to be completed for each SPS-6 section. Unfortunately, not all data was available for form completion.

There are many data forms that simply cannot be completed for lack of information. First, form one, Reference Project Station Table, cannot be completed due to insufficient cut/fill information for sections 14 through 19. Form two, Revised Layer Descriptions, could not be completed since it needs to be consistent with SHRP form L05. As of the time this document was written in early December 1992, the L05's were not complete. They are being done by Western Technologies in Phoenix. The L05 forms provide some layer thicknesses and more importantly, the layer numbers and layer identifications. Without these forms, we made the assumption that the data we had regarding the existing cross section was accurate and proceeded with that as an assumption. Hence, the Revised Layer Description forms Number 2 could not be completed.

Construction Data form seven, Overlay Placement Operations, lacks uncompacted layer thickness data. It apparently does not exist. For form eight, Overlay Compaction Data laydown temperatures, roller data, and compacted thicknesses are missing. Some roller information is known, but some is not and apparently does not exist. Form nine, Construction Quality Control Measurements, lacks nuclear density information. Nuclear information was collected for several sections in the passing lane, but only one in the SHRP sections' travel lane. Form ten, Layer Thickness Measurements lacks all data. There is apparently none available according to ADOT staff. All remaining forms lack only a few pieces of information on a sporadic basis. As far as the forms that need to be filled out go, they are all being presented here. If one form is indicated to be filled out as applicable as in the aforementioned table, it will have been included, even if the data is not available. If it is not being presented with this document, then it was not needed for the project. For instance, undersealing forms twenty-six and twenty-seven are not included here since there was no undersealing activity in the SHRP sections.

3. STRIP MAP DEVELOPMENT

The objective of this portion of the project was to prepare strip maps indicating pavement condition before and after rehabilitation for each SHRP/ADOT test section within the SPS-5 and SPS-6 project areas. PASCO Film Strips were provided to ARE by ADOT for the '89 SPS-5 (preconstruction), '91 SPS-5 (postconstruction) and '89 SPS-6 (preconstruction) sections. These filmstrips cover only the outside travel lane of each section. Also, provided were Crack Survey Maps and Summary Tables for the '91 SPS-6 (postconstruction) condition surveys which were originally prepared by the Arizona Transportation Research Center. These maps indicate conditions in both the passing and travel lane of each section. Since the ATRC maps were not drawn to scale, the ARE maps were created using data taken from the Crack Location Summary Tables. These tables are included with the SPS-6 postconstruction maps. Core sampling and NDT locations were obtained from Nichols Consulting Engineers, Chtd. (NCE).

After examining the provided information and consulting with ADOT, it was decided that ARE would prepare maps at a scale of 1" = 10' on 8-1/2" x 11" bond paper. These maps indicate the pavement condition identifying all longitudinal and transverse cracking, area/wheelpath cracking, patches, potholes and PCCP joints and striping apparent from the PASCO filmstrips. Maps derived from the ATRC condition surveys only indicate the location of cracking and the right shoulder stripe. Also, shown are the sampling/NDT locations based on information received from NCE. A legend precedes each group of drawings identifying all items found on the maps. Tables showing all core/bulk sample and NDT locations follow the map legend.

The following procedure was used to produce the '89 and '91 SPS-5 and '89 SPS-6 distress maps. The Pasco Film was supplied in several bulk rolls by ADOT. These rolls were cut into individual study sections for ease of handling. Each film strip was reproduced on sepia diazo mylar. The original film strip along with the mylar copy was examined on a light table under magnification to identify the extent of each pavement feature/distress. The mylar copies were then marked to indicate the extent of cracking, patching, striping and any other identifiable pavement feature. As a quality control check, the mylar copies were then digitized using AutoCAD Release 11 and 1 24" x 367" digitizing board. The 100' painted station marks were

used to calibrate the digitizer to allow for accurate input. After completion of the digitizing process, an individual AutoCAD file was generated for each film strip and printed on 8-1/2" x 11" bond paper at a scale of 1" = 10'.

Strip maps were provided in paper copy and on computer disk for use in future updating of each respective section.

4. CONSTRUCTION OF SPS-6

Nineteen test sections were constructed by the Arizona Department of Transportation (ADOT) as part of Strategic Highway Research Program (SHRP) Specific Pavement Studies (SPS) -6 experiment. The SPS-6 program addresses the rehabilitation of jointed portland cement concrete pavement. The objective of the SPS-6 experiment was to develop improved performance prediction models to be used for determining the additional pavement life that can be expected from the application of a variety of JCP and JRCP pavement rehabilitation methods and strategies, ranging from minimal to maximum investment in the rehabilitation treatment. The test sections in this ADOT project deal with JCP only.

EXPERIMENTAL FEATURES

Eight of the nineteen test sections meet the basic SHRP requirements for the experiment. The additional eleven sections were designed by ADOT to evaluate features that are not included in the SHRP experiment design.

The 8 SHRP sections include 3 different types of surface preparation of the existing JCP, 1) crack and seat, 2) minimum restoration, and 3) maximum restoration. They also include two different conventional asphalt overlay thicknesses - 4" and 8",two sections with no overlay, and one control section which is to receive only routine ADOT maintenance procedures.

The 11 ADOT sections include an additional surface preparation procedure - rubblizing the existing JCP - as well as an unbonded JCP overlay, asphalt overlay with fabric, various thickness combinations of asphalt rubber and conventional asphalt overlays, and asphalt rubber asphalt concrete friction course.

EXISTING PROJECT DESCRIPTION

The test sections were incorporated in ADOT Construction Project IR-40-4(123) on I-40 at Flagstaff, which extends from U.S. 89A (MP 195) to the Walnut Canyon Interchange (MP 205) in the eastbound direction. Total project length is 10 miles.

The existing pavement is a 38' roadway, consisting of two 12' travel lanes, a 10' outside shoulder and 4' inside shoulder. Travel lanes are 8" to 9" thick JCP and the shoulders are 2.5" to 3" AC. ADT ranges from 4,000 to 8,000, depending on the time of year. Truck average speed is 61 to 64 mph.

Pavement distress in the outside lane of the existing JCP consists of joint and crack spalling, longitudinal, transverse, and random direction cracking, and shattered slabs. Approximately 80% - 90% of the slabs exhibit some type of distress. Approximately 50% of the joints have spalling, 35% to 40% have longitudinal/transverse cracking, and 5% to 15% of the slabs are shattered (broken into 30 or more pieces).

CONSTRUCTION PROJECT DESCRIPTION

All the SHRP test sections were designed following the ideas in the SHRP "Specific Pavement Studies Experimental Design and Research Plan for Experiment SPS-6, Rehabilitation of Jointed Portland cement Concrete Pavements." The SHRP guidelines for construction details "Construction Guidelines for Experiment SPS-6, Rehabilitation of Jointed Portland Cement Concrete Pavements" were followed as closely as possible in construction.

Repairs and other activities on the control section were limited by SHRP to only routine maintenance needed to keep the section in a safe and functional condition. In general, the maintenance activities were required to be limited to those permitted in SHRP "Guidelines for Maintenance of General Pavement Studies (GPS) Test Sections."

The minimum level of pavement restoration includes joint and crack sealing, partial and full-depth patching, and full surface diamond grinding. The maximum level of restoration includes removing and replacing existing joint and crack sealing, performing additional joint and crack sealing, removing and replacing existing partial and full-depth patching, performing additional partial and full-depth patching, correcting poor load transfer at joints, full surface diamond grinding, retrofitting subsurface edge drains, and undersealing. These activities were to be performed only if warranted.

The crack and seat procedure for the SHRP sections was intended to produce a nominal crack spacing of 3' x 3'. The pavement was then rolled until the broken pieces were seated. Crack and seat on some of the ADOT sections was intended to produce a 4' x 6' cracking pattern. A tack coat was to be placed prior to overlay.

The rubblizing procedure on the ADOT sections was intended to break the pavement into nominal 1" to 2" pieces. It was then to be compacted with a vibratory roller and primed prior to overlay with asphaltic concrete.

Sections to receive 4" overlays were placed in two 2" lifts, the 8" overlay was placed in two 3" and one 2" lift, and 5" overlays were placed in one 3" and one 2" lift. Tack coats were applied between lifts. The unbonded PCC overlay in ADOT Section 2 was poured on 2" of asphalt concrete.

The asphalt concrete friction course (ACFC) was intended to be 5/8" thick on some of the sections (the SHRP limit is 0.75"),and the asphalt rubber asphalt concrete friction coursed (AR-ACFC) was intended to be 0.50" thick on the additional ADOT sections.

The design of asphalt concrete mixes were specified to be done in compliance with guidelines in FHWA Technical Advisory T-5040.27. Only virgin aggregates are allowed and they are expected to be of highest quality. Asphalt cement was to be selected by ADOT based on normal practice. No deviations from SHRP design and construction guidelines were allowed unless accepted by SHRP.

CHARACTERISTICS OF MATERIALS

The virgin asphalt concrete mix design was a 3/4" mix consisting of basalt course aggregate, basalt intermediate aggregate, basalt fine aggregate, Flagstaff cinders, Mahan concrete sand, and Winslow sand. Asphalt cement was AC-20 at 4.6% by weight of mix. Mineral admixture was hydrated lime at 1.5% by weight of aggregate.

The asphalt rubber asphalt concrete mix design included 20% granulated rubber of Type C 106 and AC-10 asphalt cement. Bituminous content was 6.5% by weight of mix. The mineral admixture was lime, used at a rate of 1% by weight of aggregate.

The asphalt concrete friction course (ACFC) consisted of 90% 3/8" aggregate, 4% CR Fines, 6% W-Fines, and 6.8% AC-20.

Spall repair material was CALTRANS Formula SET 45, a rapid setting patch material, with 25 lbs of rock per bag of SET 45. A 3/4" maximum size aggregate was used.

Concrete for the full-depth repairs and unbonded overlay complied with ADOT specification 1006. A Class P 4,000 psi concrete was specified. Cement was Type II Low Alkali and fly ash was Class F. Entrained air was specified to be 4% to 7%, and slump 2.5" to 4.5". Aggregate size was specified as 1.5" maximum. Actual gradation used was 1" maximum. A wax based curing compound was used. Concrete joint sealant was a silicone.

CONSTRUCTION OVERVIEW

The nineteen test sections were constructed in an approximate 2.6 mile segment of the 10 mile long I-40 rehabilitation project. Average tests section length is approximately 500', excluding transitions between sections.

The test sections were constructed between mid-June and mid-October of 1990. Efforts from mid-June through the end of July concentrated primarily on minimum and maximum surface preparations and the trench drain. Crack and seat and rubblizing was done from August 1 through August 5 and the bulk of the asphalt paving was from August 5 through August 12. The unbonded PCC overlay was placed on September 4 in the passing lane and September 24 in the travel lane. The ACFC and AR-ACFC were placed in mid-October.

Crack and seat was accomplished with a guillotine type pavement breaker and seating was done with one pass of a 50 ton roller. For the Rubblized sections a PB4 resonant breaker was used in longitudinal passes approximately 7" to 12" wide with a steel shoe using a 2,000 lb force at 44 times/minute.

The asphalt concrete mix was produced in a drum mixer plant and placed in typical 12' wide lanes. Breakdown rolling was one pass of a 12.5 ton double drum vibratory roller. Intermediate rolling was 4 passes of a pneumatic. Finish rolling was one pass of a 12.5 ton vibratory and two passes of a 12.5 ton static roller. Tack coat was an SS-1H applied at .08 gal/SY.

Tests run on the construction materials indicate they were in compliance with the specifications. Asphalt content ranged from 4.5% to 4.9%. Air voids ranged from 3.9% to 5.1% and stability was generally between 3,000 and 4,000.

The portland cement concrete 28-day average compressive strength ranged from 4,400 to 5,100 psi, with air entrainment average from 5.2% to 5.5%. Slump was in the average range of 3.6" to 4.6".

CONCLUSIONS

Design and construction of the SPS-6 test sections were successfully incorporated in ADOT Construction Project IR-40-4(123) on I-40 at Flagstaff. All features of the SHRP required SPS-6 experiment design were included in eight basic test sections. Design and construction data from these sections, along with future performance data that will be collected, will be a meaningful and important contribution to achieving the goals of the SPS-6 program.

In addition to the eight required SHRP sections, ADOT included eleven more test sections which were designed to incorporate features that are not in the SHRP SPS-6 experiment design. Continued study of these sections will provide valuable input to ADOT in its desires to develop the most effective and economical types of pavement design and construction for rehabilitation of jointed PCC pavements.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-AZ92-379-I		

4. Title and Subtitle	5. Report Date
SPS-5 and SPS-6 SHRP Data Collection	December 1992
	6. Performing Organization Code

7. Author	8. Performing Organization Report No.
	1404

9. Performing Organization Name and Address	10. Work Unit No.
AUSTIN RESEARCH ENGINEERS, INC. 2600 DELLANA LANE AUSTIN, TEXAS 78746	11. Contract or Grant No. HPR-PL-1(41)379

12. Sponsoring Agency Name and Address	13.Type of Report & Period Covered
ARIZONA DEPARTMENT OF TRANSPORTATION 206 S. 17TH AVENUE PHOENIX, ARIZONA 85007	14. Sponsoring Agency Code

15. Supplementary Notes

Prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration

16. Abstract

This project required the completion of Construction Data Forms for the Strategic Highway Research Program's (SHRP) Specific Pavement Studies (SPS) Experiment Number 5, The Rehabilitation of Asphalt Concrete Pavements, and Experiment Number 6, The Rehabilitation of Jointed Portland Cement Concrete Pavements. In Arizona, the SPS-5 experiment construction was done in the eastbound travel lane of Interstate Highway 8, between mileposts 159 and 161 in southwestern Arizona. Eleven test sections were constructed for the experiment, with eight as set forth in SHRP guidelines. In addition, two additional sections were constructed, and one designated as the control section, for a grand total of eleven sections. There are eleven SHRP Construction Data Forms. Each Form covers a general topic related to the rehabilitation construction.

The SPS-6 experiment construction was in the eastbound travel lane of Interstate Highway 40, between mileposts 202 and 205 in northern Arizona. Eighteen test sections were constructed for the experiment, with eight as set forth in SHRP guidelines. In addition, nine additional sections were constructed, and one designated as the SHRP control section, for a grand total of eighteen sections. There are twenty seven of the SHRP Construction Data Forms and are numbered one through three and seven through thirty. Each form covers a general topic related to the rehabilitation construction.

17. Key Words	18. Distribution Statement	23. Registrant's Seal
Pavement, rehabilitation, SHRP, asphalt concrete, portland cement concrete	Document is available to the U.S. Public through the National Technical Information Service, Springfield, Virginia 22161	

19. Security Classification	20. Security Classification	21. No. of Pages	22. Price
Unclassified	Unclassified	17	

METRIC (SI*) CONVERSION FACTORS

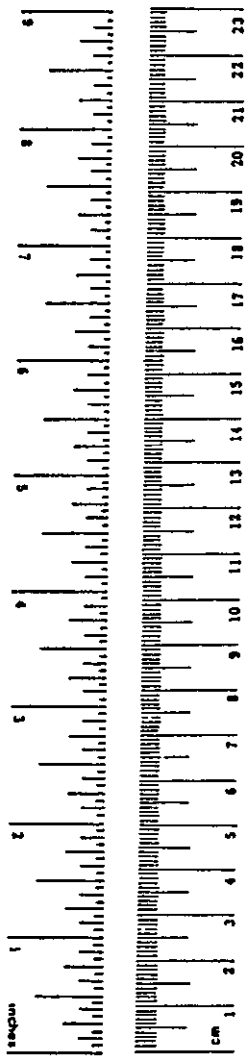
APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	2.54	centimetres	cm
ft	feet	0.3048	metres	m
yd	yards	0.914	metres	m
mi	miles	1.61	kilometres	km
AREA				
in^2	square inches	645.2	centimetres squared	cm^2
ft^2	square feet	0.0929	metres squared	m^2
yd^2	square yards	0.836	metres squared	m^2
mi^2	square miles	2.59	kilometres squared	km^2
ac	acres	0.395	hectares	ha
MASS (weight)				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
VOLUME				
fl oz	fluid ounces	29.57	millilitres	mL
gal	gallons	3.785	litres	L
ft^3	cubic feet	0.0328	metres cubed	m^3
yd^3	cubic yards	0.0765	metres cubed	m^3

NOTE: Volumes greater than 1000 L shall be shown in m^3.

TEMPERATURE (exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

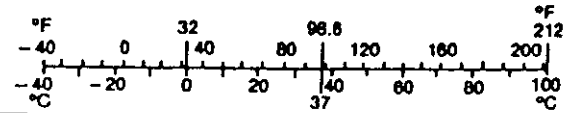


APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
mm	millimetres	0.039	inches	in
m	metres	3.28	feet	ft
m	metres	1.09	yards	yd
km	kilometres	0.621	miles	mi
AREA				
mm^2	millimetres squared	0.0016	square inches	in^2
m^2	metres squared	10.764	square feet	ft^2
km^2	kilometres squared	0.39	square miles	mi^2
ha	hectores (10 000 m^2)	2.53	acres	ac
MASS (weight)				
g	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams (1 000 kg)	1.103	short tons	T
VOLUME				
mL	millilitres	0.034	fluid ounces	fl oz
L	litres	0.264	gallons	gal
m^3	metres cubed	35.315	cubic feet	ft^3
m^3	metres cubed	1.308	cubic yards	yd^3

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



These factors conform to the requirement of FHWA Order 5190.1A.

* SI is the symbol for the International System of Measurements

SPS 5 - ARIZONA

DRILLING, SAMPLING AND LABORATORY TESTING PLAN

TENTATIVE LABORATORY TESTING PLAN - SPS-5 ARIZONA

SAMPLING AREA S1

AC Surface

A1 - AC01, AC02, AC03
BA2 - AC04, AG01, AG02, AG03, AG04, AE01, AE04, AE05, AE06
C1 - AC01, AC05

Aggregate Base

BA1 & BA2 & BA3 - UG01, UG02 and UG03, UG04 if appropriate; UG05, UG07, UG08, UG09, UG10

Unbound Subbase

BA1 & BA2 & BA3 - UG01, UG02, UG03, UG04, UG05, UG07, UG08, UG09, UG10

Subgrade

A1 - SS07, SS08, SS10
BA1 & BA2 & BA3 - SS01, SS02, SS03, SS04, SS05, SS09

SAMPLING AREA S2

AC Surface

C2 - AC01
A2 - AC01, AC02, AC03

Aggregate Base

None

Unbound Subbase

None

Subgrade

A2 - SS07, SS08, SS10

SAMPLING AREA S3

AC Surface

TP1 - AC04, AG01, AG02, AG03, AG04, AE01, AE04, AE05, AE06
A3 - AC01, AC02, AC03
C3 - AC01, AC05
C4 - AC01, AC05
C5 - AC01, AC07
C6 - AC01, AC06
C7 - AC01, AC06
C8 - AC01, AC06
C9 - AC01, AC07
C10 - AC01, AC07
C11 - AC01, AC07

Aggregate Base

TP1 - UG01, UG02 and UG03, UG04 if appropriate, UG05, UG07, UG08, UG09, UG10

Unbound Subbase

TP1 - UG01, UG02, UG03, UG04, UG05, UG07, UG08, UG09, UG10

Subgrade

A3 - SS07, SS08, SS10
TP1 - SS01, SS02, SS03, SS04, SS05, SS09

SAMPLING AREA S4

AC Surface

A4 - AC01, AC02, AC03
C12 - AC01

Aggregate Base

None

Unbound Subbase

None

Subgrade

A4 - SS07, SS08, SS10

SAMPLING AREA S5

AC Surface

BA5 - AC04, AG01, AG02, AG03, AG04, AE01, AE04, AE05, AE06
A5 - AC01, AC02, AC03
C13 - AC01

Aggregate Base

BA4 & BA5 & BA6 - UG01, UG02 and UG03, UG04 if appropriate, UG05, UG07, UG08, UG09, UG10

Unbound Subbase

BA4 & BA5 & BA6 - UG01, UG02, UG03, UG04, UG05, UG07, UG08, UG09, UG10

Subgrade

A5 - SS07, SS08, SS10
BA4 & BA5 & BA6 - SS01, SS02, SS03, SS04, SS05, SS09

SAMPLING AREA S6

AC Surface

C14 - AC01
A6 - AC01, AC02, AC03

Aggregate Base

None

Unbound Subbase

None

Subgrade

A6 - SS07, SS08, SS10

SAMPLING AREA S7

AC Surface

A7 - AC01, AC02, AC03
TP2 - AC04, AG01, AG02, AG03, AG04, AE01, AE04, AE05, AE06
C15 - AC01, AC05
C16 - AC01, AC05
C17 - AC01, AC07
C18 - AC01, AC06
C19 - AC01, AC06
C20 - AC01, AC06
C21 - AC01, AC07
C22 - AC01, AC07
C23 - AC01, AC07

Aggregate Base

TP2 - UG01, UG02 and UG03, UG04 if appropriate, UG05, UG07, UG08, UG09, UG10

Unbound Subbase

TP2 - UG01, UG02, UG03, UG04, UG05, UG07, UG08, UG09, UG10

Subgrade

A7 - SS07, SS08, SS10
TP2 - SS01, SS02, SS03, SS04, SS05, SS09

SAMPLING AREA S8

AC Surface

C24 - AC01
A8 - AC01, AC02, AC03

Aggregate Base

None

Unbound Subbase

None

Subgrade

A8 - SS07, SS08, SS10

SAMPLING AREA S9

AC Surface

A9 - AC01, AC02, AC03
BA8 - AC04, AG01, AG02, AG03, AG04, AE01, AE04, AE05, AE06
C25 - AC01

Aggregate Base

BA7 & BA8 & BA9 - UG01, UG02 and UG03, UG04 if appropriate, UG05 UG07, UG08, UG09, UG10

Unbound Subbase

BA7 & BA8 & BA9 - UG01, UG02, UG03, UG04, UG05, UG07, UG08, UG09, UG10

Subgrade

A9 - SS07, SS08, SS10
BA7 & BA8 & BA9 - SS01 , SS02, SS03, SS04, SS05, SS09

SAMPLING AREA S10

AC Surface

A10 - AC01, AC02, AC03
C26 - AC01

Aggregate Base

None

Unbound Subbase

None

Subgrade

A10 - SS07, SS08, SS10

SAMPLING AREA S11

AC Surface

A11 - AC01, AC02, AC03
C27 - AC01, AC05
BA11 - AC04, AG01, AG02, AG03, AG04, AE01, AE04, AE05, AE06

Aggregate Base

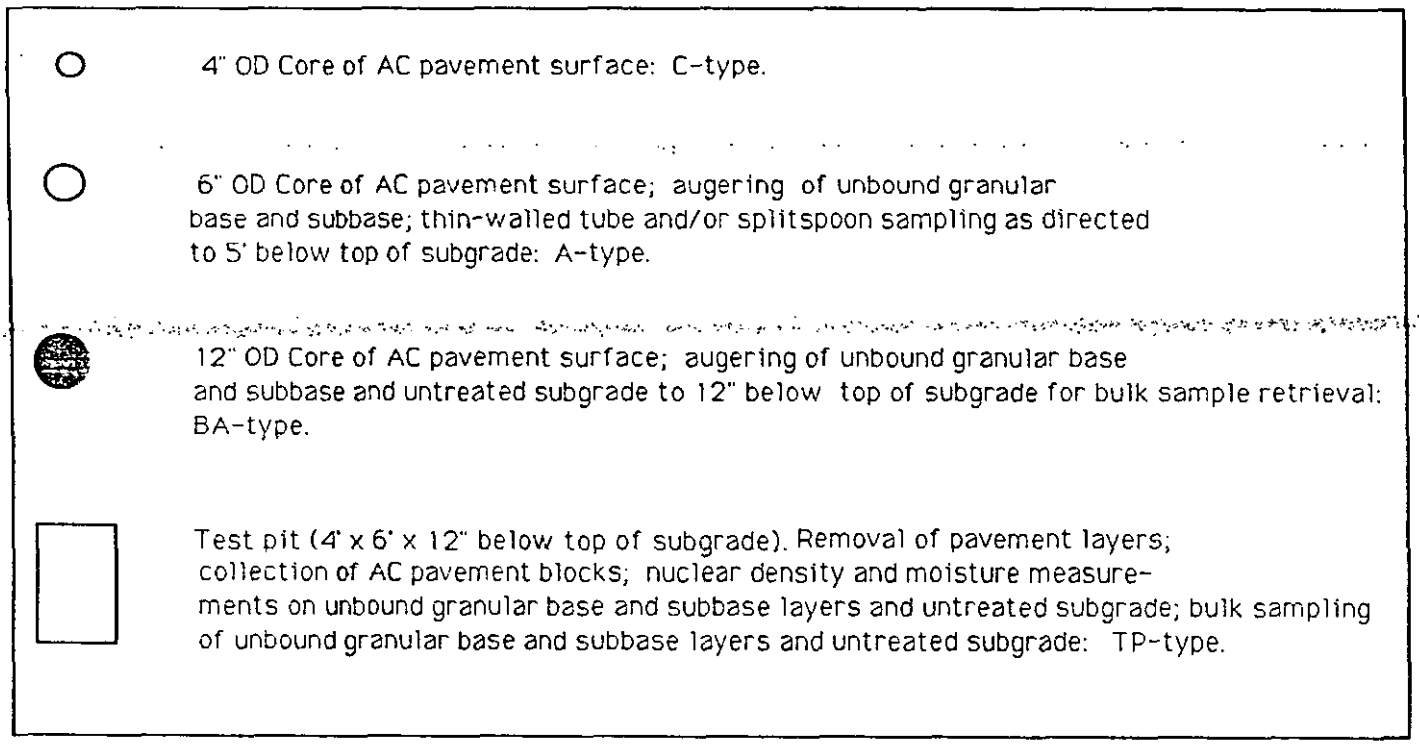
BA10 & BA11 & BA12 - UG01, UG02 and UG03, UG04 if appropriate, UG05, UG07, UG08, UG09, UG10

Unbound Subbase

BA10 & BA11 & BA12 - UG01, UG02, UG03, UG04, UG05, UG07, UG08, UG09, UG10

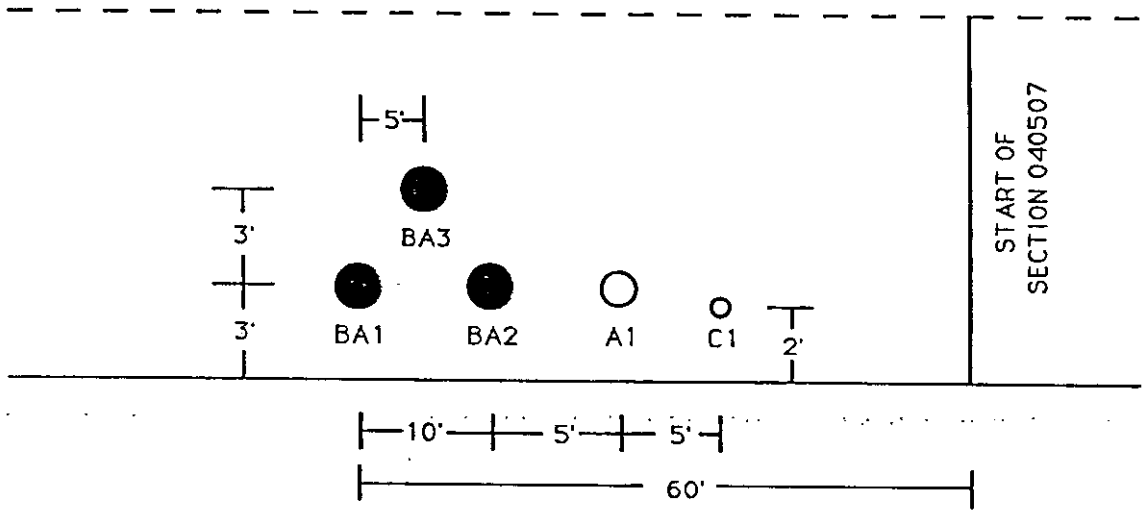
Subgrade

A11 - SS07, SS08, SS10
BA10 & BA11 & BA12 - SS01, SS02, SS03, SS04, SS05, SS09

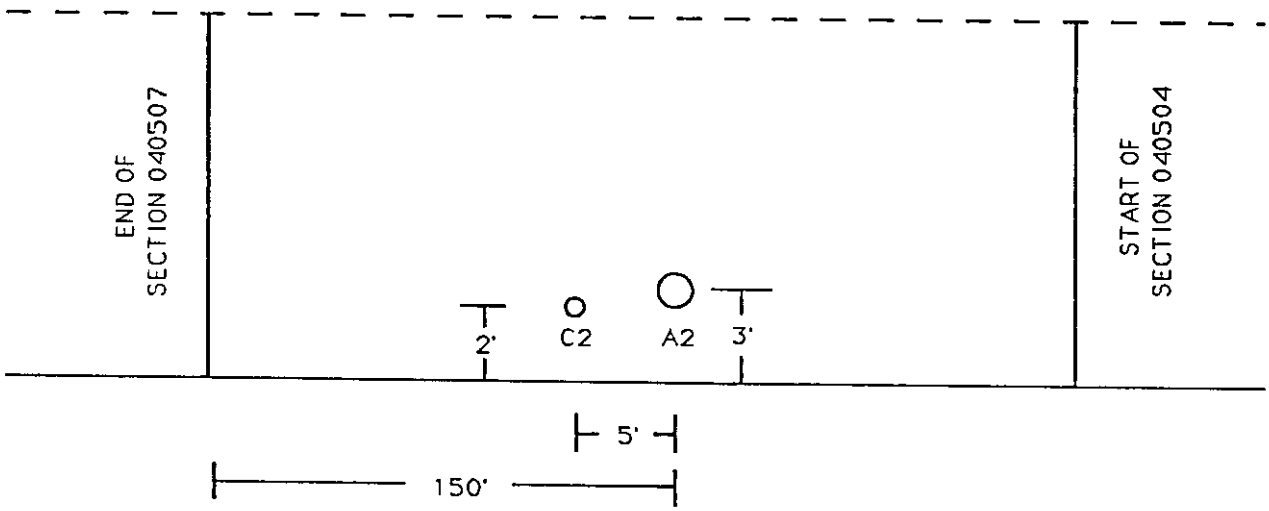


SUMMARY OF SAMPLING LOCATION TYPES - ARIZONA

NOT TO SCALE



SAMPLE AREA S1



SAMPLE AREA S2

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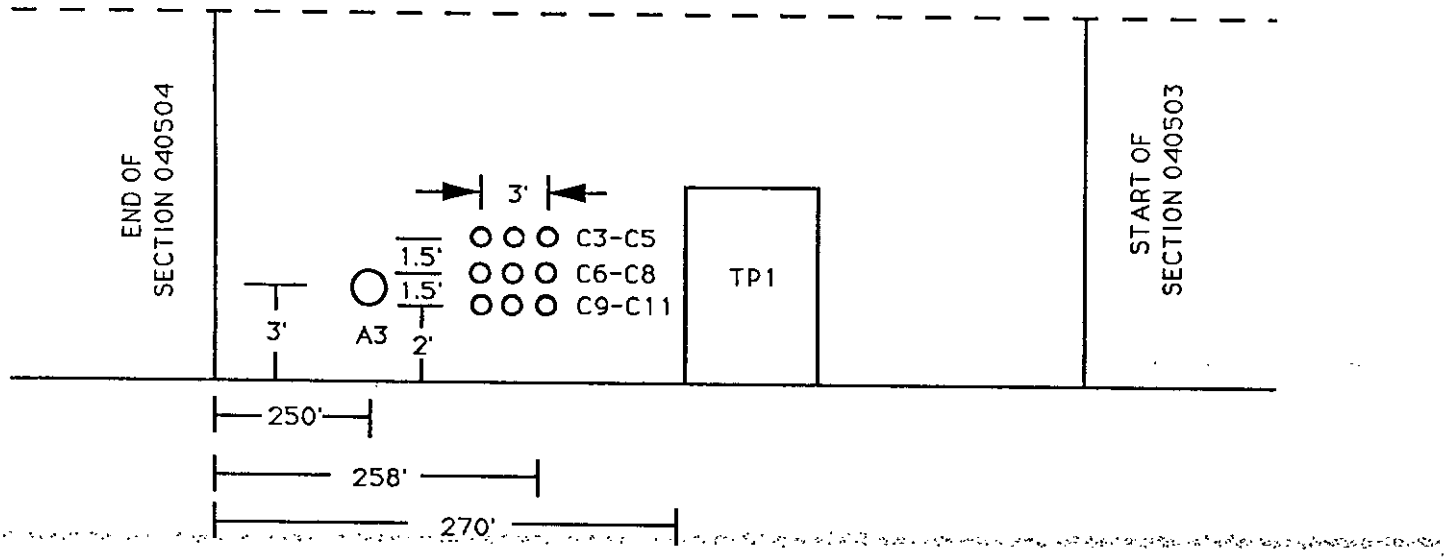
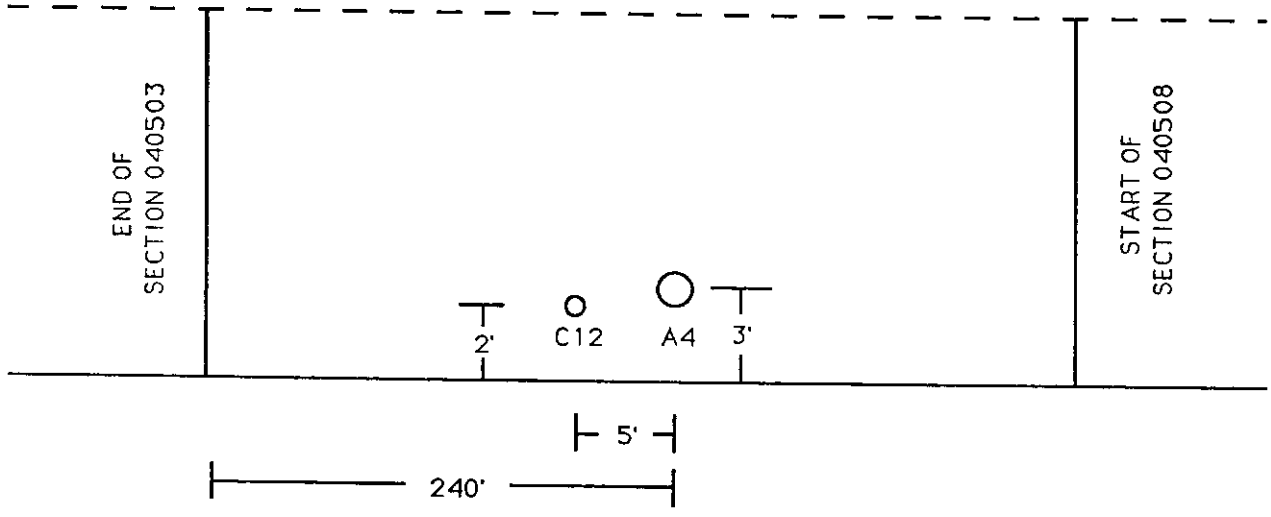


SAMPLE AREA S3



SAMPLE AREA S4

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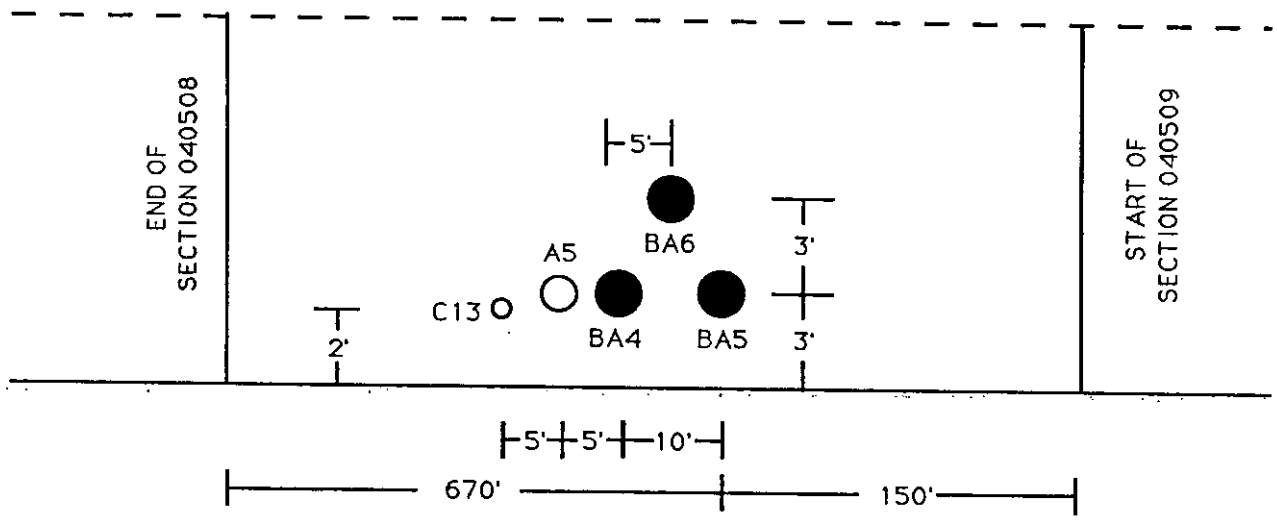
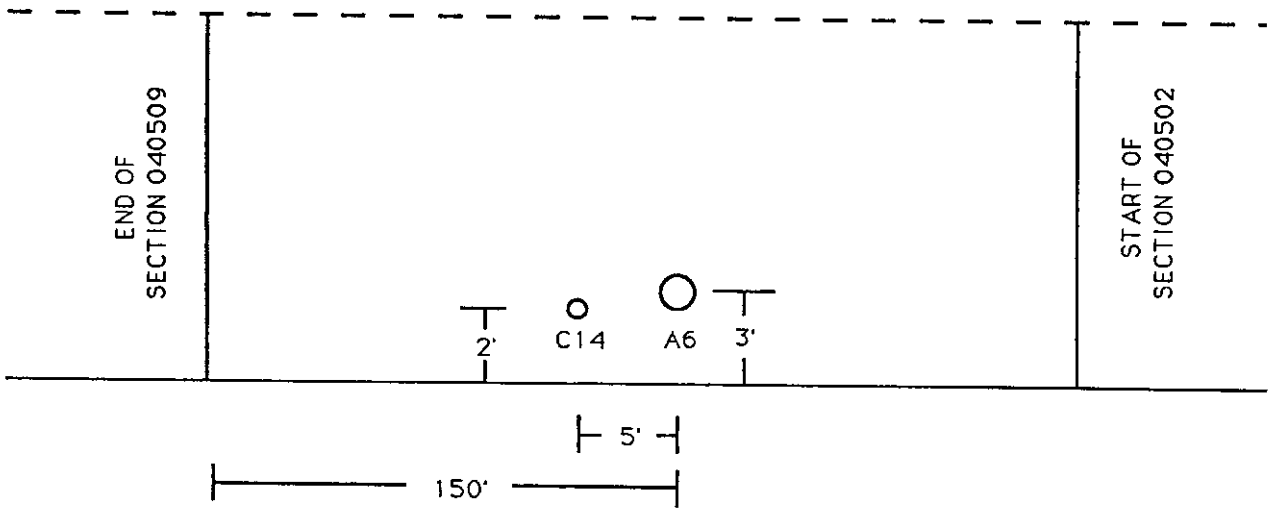


SAMPLE AREA S5



SAMPLE AREA S6

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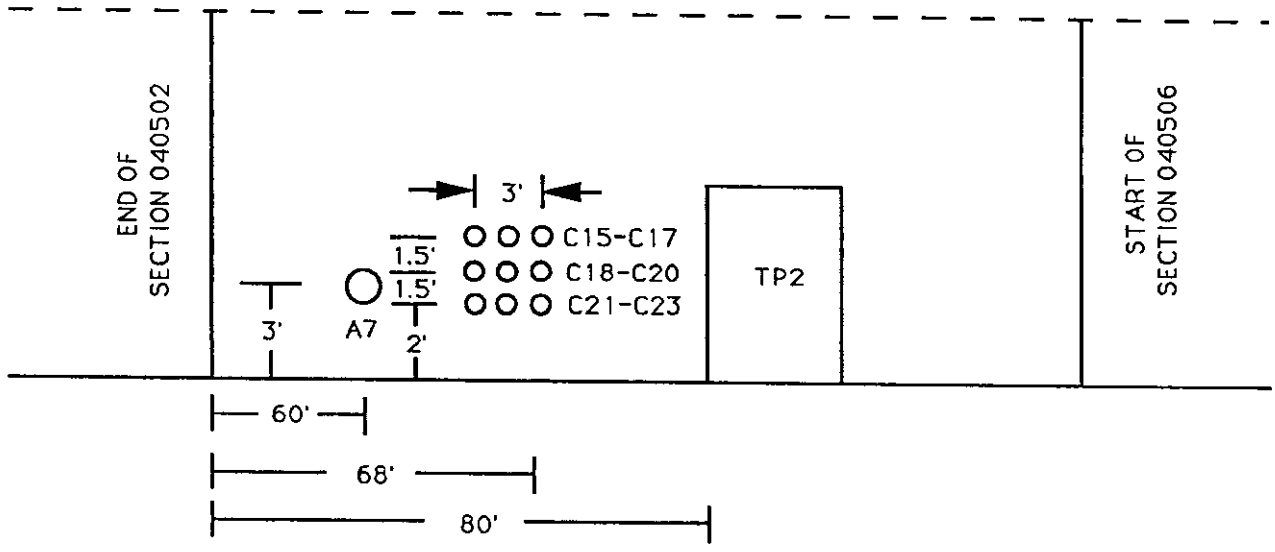
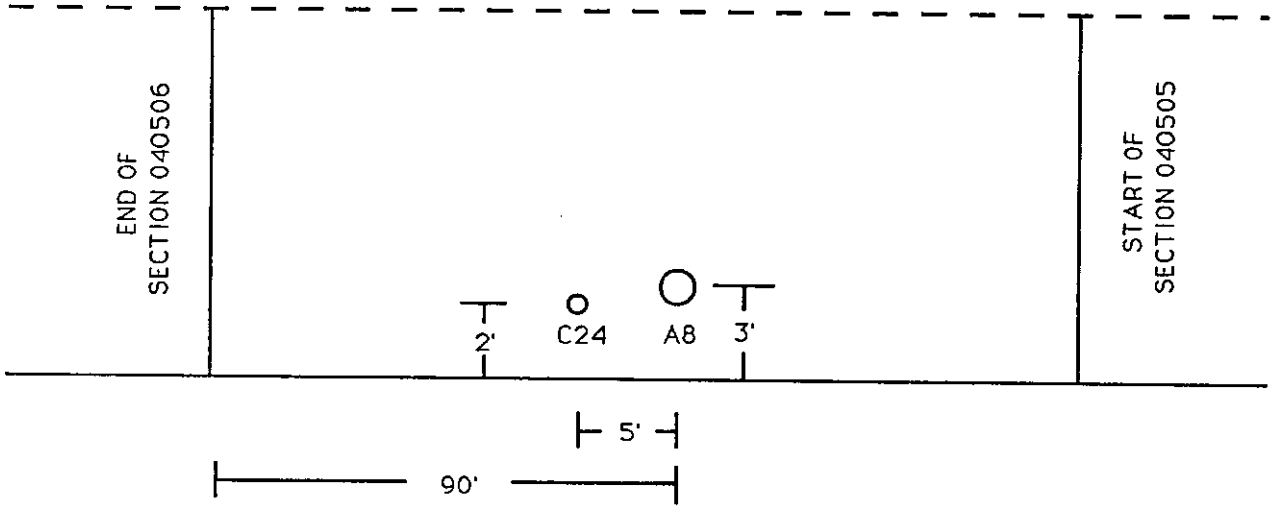
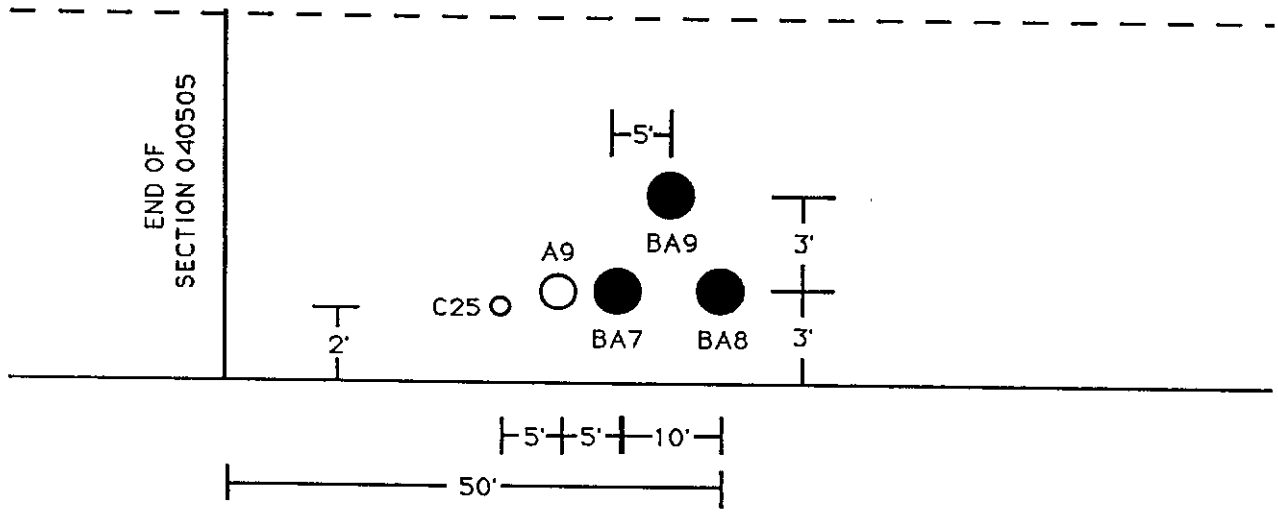


SAMPLE AREA S7



SAMPLE AREA S8

NOT TO SCALE

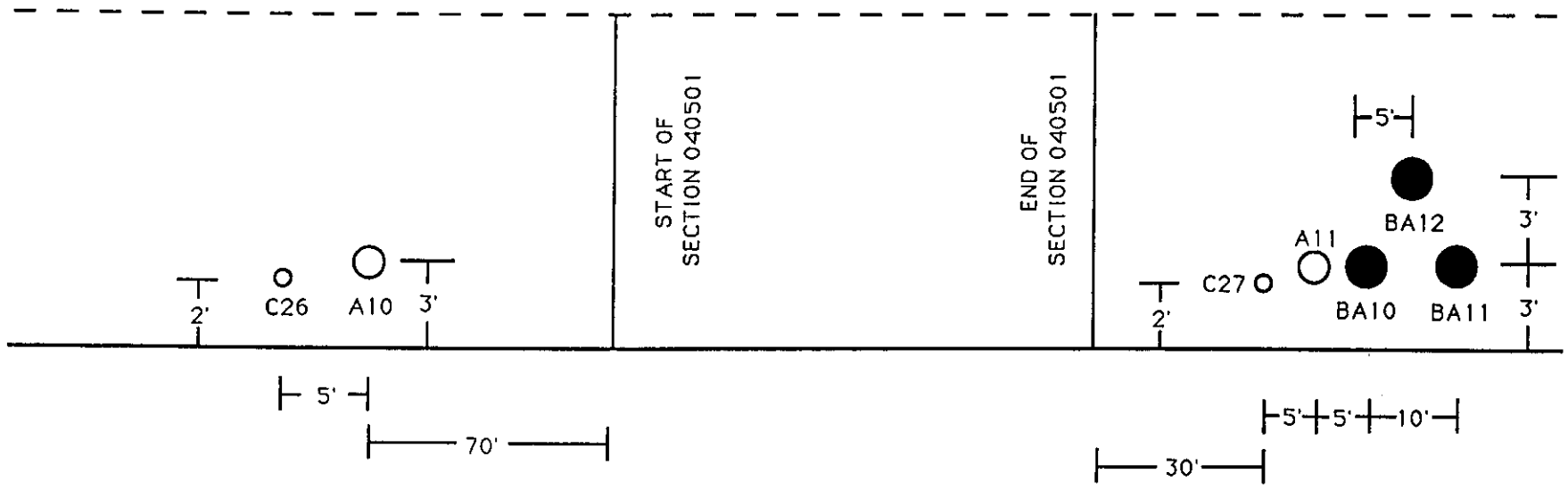


SAMPLE AREA S9

SAMPLING AREAS S10 AND S11, NEXT PAGE

NOT TO SCALE

ARIZ-13



SAMPLE AREA S10

SAMPLE AREA S11